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face 132 engages an annular forward shoulder 136 extending radially outwardly from enlarged diameter section 118 of male sub 114 and rear face 134 engages a rearward shoulder 138 extending radially inwardly from an inner surface 140 of nut 126 to thereby prevent nut 126 from pulling off of pup joint 110 (to the right in FIG. 4) when nut 126 is threaded onto the female sub of another pup joint.

According to the present invention, pup joint 110 is also provided with a retention shoulder 142 extending radially outwardly from enlarged diameter section 118 of male sub 114. Retention shoulder 142 comprises an outside diameter which is greater than the inside diameter of retainer segments 130. Rearward shoulder 138 of nut 126 is restricted from movement relative to retainer segments 130 by a retainer ring 131 located in a corresponding groove in retainer segments 130. In an embodiment of the invention wherein retention segments 130 are not employed, such as in conjunction with the pup joint 34 described in reference to FIG. 2, retention shoulder 142 comprises an outside diameter which is greater than the diameter of rearward shoulder 138 of nut 126. Therefore, nut 126 and retainer segments 130 (or nut 126 alone) are preventing from sliding off of male sub 114 and down pipe 112 (to the left in FIG. 4) when pup joint 110 is oriented in a non-horizontal position.

Referring to FIG. 5, pup joint 110 is preferably constructed of a single forging 144 comprising identical upset ends 146, 148. Upset end 146 is machined into male sub 114, and retention shoulder 142 is formed by turning down large diameter section 118. Upset end 148 is likewise machined into female sub 116. This method of manufacture simplifies the forging process. In addition, this method of manufacture results in a retention shoulder which cannot be removed or otherwise defeated in the field.

It should be recognized that, while the present invention has been described in relation to the preferred embodiments thereof, those skilled in the art may develop a wide variation of structural details without departing from the principles of the invention. Therefore, the appended claims are to be construed to cover all equivalents falling within the true scope and spirit of the invention.

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What is claimed is:

1. A pup joint comprising:

length of pipe;

a female sub connected to a first end of the pipe, the female sub including a conical sealing surface, an outer surface formed adjacent the conical sealing surface and external threads formed on the outer surface;

a male sub connected to the distal end of the pipe, the male sub including a forward shoulder extending radially outwardly therefrom and a spherical sealing surface adjacent the forward shoulder which is adapted to mate with and seal against the conical sealing surface of another such pup joint;

a nut having an internal surface, internal threads formed on the internal surface and a rearward shoulder extending radially inwardly from the internal surface;

one or more retainer segments positioned between the rearward shoulder of the nut and the forward shoulder of the male sub for restricting axial movement of the nut relative to the male sub in a first direction;

a retainer ring positioned in a corresponding groove formed in the retainer segments and having an outer diameter which is greater than the diameter of the rearward shoulder to thereby maintain the nut positioned around the retainer segments; and

a retention shoulder extending radially outwardly from the male sub rearwardly of the forward shoulder, the retention shoulder comprising an outside diameter greater than the inside diameter of the retainer segments;

whereby the retention shoulder restricts axial movement of the nut and the retainer segments relative to the male sub in a direction opposite the first direction.

2. The pup joint of claim 1, wherein the male sub and the female sub are formed integral with the pipe.

3. The pup joint of claim 2, wherein the pipe, the male sub and the female sub are constructed of a single forging and the retention shoulder is machined into the male sub.

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